percent correct in what the predictions were as to where things would be easy and where they would be difficult in making the transition.

But the thing that I think we failed to look at that is the real hold-up is that inter-industry friction that is going on right now, and where decisions could be made by the Commission, for example, that haven't been made to this point, that might help move things forward.

So I guess it comes down to you give incentives by in this case offering some opportunities that weren't there before, and there are clearly opportunities for broadcasters that were not there before.

But at the same time, you have to make sure that those opportunities don't come with such impediments that they are meaningless or worthless. And we are seeing that, for instance, in the failure to get cable carriage for broadcasters.

We are seeing that in the failure to get the necessary security for the intellectual property that will encourage the entertainment industry to provide content of the quality level that broadcasters seek.

Now there are all kinds of issues of

that sort and until they are sorted out will continue to, if not stymie, at least stifle the transition. So I think it is both sides. I think you have to have the stick if you will, and you have to have the date certain by which people are expected at least to do certain things.

But you also have to make sure that the way is open for them to do what you ask them to do, in a way that doesn't at the same time kill their businesses.

MR. WEINREICH: Steve.

MR. GILLIG: Yes. Responding on the question of whether there should be some subjective considerations, I think that there certainly should be subjective things like what is the public utility of usage of certain spectrum.

And so, for example, in the case of public safety where obviously the public utility is very, very high, and that is even more emphasized by recent occurrences over the last year.

But in that case there I think we have to be careful before we set higher measures for efficiency, because we don't want to in any way degrade the current public utility.

And I am not taking a near term versus

long term view. I just think that is something that we have to consider.

MR. WEINREICH: Thank you.

MR. ENGELMAN: How about other services, Stephen? The CMRS service, the mobile services, tend to be competitive. Is there adequate incentive there you think for spectrum efficiency? Should there be more incentive?

MR. BLUST: I think the fact of maintaining -- an individual service provider and operator maintaining their competitiveness in the marketplace is a pretty big incentive right there.

I think that one of the things that we see at least in the CMRS, cellular PCS, is the fact that there is a measure of flexible use associated with that spectrum, and there is a boundary condition.

Obviously, you always need some sort of boundary conditions, but that has allowed the advancement of the technologies, and the deployment of those technologies in conjunction with the business case, the perceived market need, the demand, what the public and the consumer wants the movement from voice to data messaging and so forth.

And that's I think allowed the investment in the technology development to take place, to provide those services in the most efficient way. When you are spectrally constrained, you tend to develop the best solutions that you can develop.

There is a balance between how much you can economically place, versus what you can do with the technology. You can always perceive of technologies that are so costly that you will never be able to deploy them, and then there is no benefit.

I think that is a balance that we have to look at, and certainly in looking at spectrum as we have pointed out in the CMRS industry, additional spectrum lets us move forward with bringing those services to the marketplace around the technologies that we have defined and designed.

And once we get those services and those technologies in place, we will do improvements and enhancements on those technologies. You may not necessarily fully replace them over a 10 year window, and certainly that is maybe your next horizon.

But during that period of time, we have

learned to apply the advantages and the enhancements to make it more effect and more efficient, and a flexible use policy let's us do that without being dramatically encumbered.

MR. WEISS: Well, I think that would be -- that is probably one of the best ways to be more efficient, is to take the basic platform and then use different applications, or develop things from your basic platform so that you can provide more efficient, or a more beneficial service to your customer.

That is one thing that I think that digital technologies kind of lend themselves to that type of thing, because you can always look around and find a few unused bits or something like that to try and apply to a better purpose.

MR. ENGELMAN: Does anyone in the audience have comments on this? Oh, boy.

MR. WEINREICH: Okay. Let's see. In the third row there.

MR. SPITZER: I am Adam Spitzer from Telecom Filings. I think if we are truly looking forward, I think that we will all agree that the discreet lines between the content and services of the various sectors, be it broadcast or CMRS, or

satellite, that they are providing, those discreet lines are sort of going away.

And we are seeing so much crossover in the services that it is not going to be a regulatory -- you know, carrot or stick. It is not going to be a mandate that invokes the change, but the universal driver that you spoke of is going to be the profitability of special efficiency.

That if we create the market conditions that the license holder can profit from his spectral efficiency with secondary markets, and allowing them to further use the spectrum that they already have.

It is not going to be setting goals and then seeing did they make the goal, or did they not make the goal, and conditioning their license going forward, but saying here is the market condition that you are going to profit from better use of the real estate that you have already taken.

MR. ENGELMAN: And how do you get that profit out of someone who is non-profit?

MR. WEINREICH: Right.

MR. SPITZER: I don't know how that applies to the public safety license holders. Obviously that is a little bit of a different

situation, but maybe in that case it is the Federal regulators who can set the goals and sort of force the change.

But I think in the commercial space it is going to be the conditions of who can make the best use of it. And perhaps as you said before, you know, you have got televisions that are old and that the cost to the consumer is a consideration.

The gentleman before made a comment about the automobile, and the automobile that is older. Obviously an old automobile is using more gasoline than a new automobile, and we are seeing people changing to the hybrids or the more efficient engines.

And it is not probably going to happen because we mandate people have to drive more efficient cars. It is because the gasoline prices get the consumer motivated as well, and perhaps we will see not only the license holder aiming for spectral efficiency, but perhaps the consumer themselves looking for devices and services that they can use, and perhaps they will get on board.

MR. WEINREICH: But in that case the consumer is paying for the gasoline. What does the television viewer pay for?

MR. SPITZER: Maybe he will have more content and more services within the same amount of -- you know, I --

MR. WEISS: Actually, I would agree with that. Just thinking about what you were saying, that the driver there would be if you can get the broadcasters to offer more services that the consumers want, that will encourage consumers then to transition from analog to digital, because it is the digital transmission that allows us more services to be offered.

But you then have to make it possible for the broadcaster t do that.

MR. SPITZER: You asked us to look forward. I could merely look to Japan where people pay for their services by the bit, you know, and if that is not a measure of efficiency, then that is a consumer actively getting into it.

MR. WEINREICH: One over on this side.

MR. EPSTEIN: Good morning. Bart Epstein from Latham and Watkins for Cognio. During last week's unlicensed discussions, we talked about how the Commission might play a role in encouraging efficiency by either giving incentives for or

possibly requiring unlicensed devices to use intelligent, adaptive, cognitive, or otherwise intelligent features, such as listen before you transmit, automatic power regulation, frequency hopping.

And there has been some interesting discussion about possibly setting aside future unlicensed bands for the types of devices which specifically agree to use some form of intelligent abilities.

And I am wondering if this kind of notion also plays a role in the license bands, to the extent that efficiency can be measured not just and within how one type of provider plays nicely with those of a like service, but to the extent that we can encourage competing technologies, which would otherwise cancel each other out when they are on adjacent bands, to somehow use these technologies, which otherwise they might not, because the benefits accrue to users outside of their own band. Thank you.

MR. WEINREICH: Well, I think we have that to a certain extent already. As I mentioned before, satellites routinely share frequencies with fixed-service radio relay licensees, and not only

in the United States, but around the world.

And this is a situation that has been in existence for a long time, and it seems to me to say that you want to have some kind of spectrum planning that would allow this to happen.

I am not quite sure if I understand exactly how you would have one service accrue a benefit at the expense of another. I can see how adjacent services might be -- there might be one that would tend to interfere with another one, but that would be the reason that you would try to group the services so that the like types of modulation or like types of service could share a band rather than be at odds with it. Yes?

MR. EPSTEIN: For example, right now we have -- and just to follow up on that point, for example, right now we have the situation where the public radios for the localities are being interfered with by some cellular use.

It depends on how we define the property right. If the public safety has the property right to force cellular to make a change, then cellular will have to make the change.

But if the property right is undefined, or if it belongs to cellular, cellular doesn't have

an incentive to adapt or adopt a technology which would otherwise not improve cellular, but would reduce interference to public service.

And if down the road the Commission adopted rules which said that users of the bands not only need to be efficient in themselves, but they need to be able to intelligently sense interference in out-of-band emissions.

And that was the situation in which I was discussing how externalities would otherwise accrue to users of other bands, and this is something which might not happen unless the commission puts in place some framework.

MR. WEINREICH: Thank you. Carl.

MR. STEVENSON: Going back to what Dr. Rohde was saying before with respect -- and I would like to point out that I have the utmost respect for the public safety community and all the important services that they provide to us.

But there is the point of how do you make a transition from analog to digital technology, and I would submit that we have the technology today that gates and signal processing cycles are cheap enough that you can economically produce a multi-mode radio that could ease the

transition.

Communications equipment has a finite life, and that practical life is constantly being shortened by the advancement of technology, and you get performance increases and cost reductions from that advancement in technology.

I think I am on my fourth cell phone in five years. Every one is cheaper, and does more things for me, and so on, and so forth. I don't mind changing them. If I perceived a benefit and programming was available, I wouldn't mind replacing a couple of television sets to get those extra benefits.

But there are some services, as has been pointed out, where there is more or less fundamentally no incentive to change. And I really believe that in those situations that incumbents should not be permitted by the Commission to remain frozen in some sort of antiquated time-technology space forever when others require spectral resources as the demand constantly increases.

And as I mentioned before, in the IEEE 802 wireless standards, we have gone from 1 megabyte to 11 megabytes, to 54, and we are looking at 200 and beyond now, and up through 54, we have

stayed within the same spectral mask.

So we have improved spectral efficiency a factor of 54 times, and this is something that the industry's standards bodies have done voluntarily because it is in the interest of the industry to do this. I believe the Commission should require incumbents, if necessary, to keep reasonably abreast, but obviously this can't be something draconian.

It has to be reasonable, in terms of equipment life cycles, and economics, but it is just clearly with the increasing demand for spectrum, we cannot continue to allow these perpetual property rights to accrue to blocks of spectrum and not see improvements being made.

MR. WEINREICH: Well, Marc, first, and then in the back.

DR. GOLDBURG: I would like to ask a question about allocation policies as they relate to spectral efficiency. So, you know, much of the discussion this morning has focused on that we have certain services and certain bands, and how efficient can they be.

But it turns out that some of the bands are just naturally more suited to certain

applications than others. So if you look -- and the spectral efficiency crunch is also sort of band dependent.

So, for example, if you look at the mobility spectrum, which is maybe from a couple of hundred megahertz to about 2-1/2 gigs for propagation reasons, and form factor reasons, which is where the spectral efficiency crunch is highest, and you look at what is in there, there are a lot of applications that are fixed, for example.

And so in a sense the spectral efficiency problem for mobile applications is being heightened artificially. So do any of the panel members see a possibility over time of taking technologies, or really services that could be moved to other bands, through an allocation process, and doing so.

For example, Mr. Weiss gave an example earlier in the day of moving t.v. from sort of the big stick model, where you really did need sort of lower frequencies for good prorogations, and moving to a more cellular architecture, which may be sort of in the distant future, and would allow t.v. services to be relocated out of the mobility spectrum to some higher frequency.

MR. WEINREICH: Does anybody want to comment on that? Paul.

MR. RINALDO: Yes, I will take a chance here. Well, yes, we have propagation as the basis of the problem, and especially in a microcellular environment what you have done is perhaps you have connected these things together with fiber, and then you provide these little cells there where the people are who are going to do the talking.

And, yes, it does amount to a better efficiency. And I think some of the problem has to do with what is left on the air, and what is conducted. I know that there has been a change in the television broadcasting over the years.

We have had just over-the-air broadcasting to begin with, and now much of it is conducted through the cable t.v., and perhaps cellular, or perhaps fiber optics will play a major role in that.

In terms of mobility that you just mentioned, there was a time that the ITU, for example, paid no attention to land mobile because they considered it more or less landlocked. It had to do with your own country, and mobile radios were in cars.

You didn't transport cars from one country to another because that would be stupid and uneconomic, and so why even talk about it. Well, now we have a situation where mobility seems to be it.

If I have an office, and my desk is over here, and I want to move my desk over there and I have a building engineer who rules the day, I have to either wire it myself, in which case I have to clandestinely run the wires so that he doesn't see it, or else I get a radio solution of some kind.

So then there are doctors. They can't go to their telephone any longer. They have to carry their telephone with them. Now they have got to carry their little other device with them. So in other words, what I am saying here is that mobility has just upset this whole apple cart.

We had a nice little system where things that had to be transmitted over radio were done that way, and things that were done on land line were done that way, and the two didn't mix all that much.

But now it seems that we are over-emphasizing the mobility part of it, and if you

simply take a radio solution to the mobility part and don't figure in the conducted carriers, such as fiber, and start to deploy a cellular approach, then it gets more and more congested. Thank you.

MR. WEINREICH: Thank you. In the back.

MR. KRAVITZ: Troy Kravitz, New America Foundation. Building upon the last two comments from the audience, I would like to just make a point. In dealing with incumbents, I understand that is a delicate issue, but the two key things to remember is that spectrum is a public asset, and it was allocated in no uncertain terms a non-permanent basis.

Now, I don't want to decompartmentalize this discussion too much further, but when you deal with broadcasts, we are doing a tremendous disservice to clump them together with the other spectrum uses.

Broadcasting is where the spectrum crunches the highest, and it is also grossly inefficient. You are looking at roughly 402 megahertz of prime real estate, where only 13 to 15 percent of the U.S. derive their broadcast, their

television channels, via this, via broadcasting.

These people could very easily be transferred to cable or satellite at a cost of something like 3 billion, and the estimates are out there. And this real estate could again be reopened, where as I said before, where the crunch is the highest.

Now, in cases like this, there should be no discussion about whether there should be a carrot or a stick. It is quite clear that the stick is the only option when they have no other incentive to transfer over.

MR. WEINREICH: Dr. Toh, please.

DR. TOH: I think there is a general trend that we wanted to achieve spectrum efficiency across a variety of services, including public safety. Eventually, we will come to a point where there is a proliferation of systems, systems of systems, and we need to phase out some of the older systems so that the migration path and the dynamic relocation of the spectrum creates quite a bit of issues.

One of those include logistics. So this redeployment, reprogramming of bay stations, call networks, assess networks, could be pretty

scary to some telcos groups.

But I would think that there should be a general knowledge that we should use scarce resources efficiently.

MR. WEINREICH: Okay. Over here on the left-hand side, my left-hand side.

MR. ACHTNER: Hello. Edward Achtner from Telecom Filings. There was a general view held by many that one of the most efficient ways of allocating spectrum was via an auction.

And I am wondering how this contrasts where you look at part of the -- some of the most dynamic growth in products and services in the wireless industry is in unlicensed bands, where people have not had to necessarily pay a dime for the rights to use that spectrum.

And I am wondering how different enabling technologies as we again look forward, such as offer to find radio or cognitive radio, really will affect the underlying or fundamental understanding that for spectrum public auctions are the most efficient mechanism for allocation.

MR. WEINREICH: Anybody want to comment on hat one. Charlie.

MR. TRIMBLE: Certainly auctions are an

efficient way of allocation spectrum where there is an economic price per bit that can be charged. It clearly works in the cellular environment.

It doesn't work nearly as well where you want to encourage experimentation, because in general the services aren't ubiquitous.

MR. WEINREICH: Thank you, Charlie.

MR. ENGELMAN: Can I ask, by ubiquitous you mean you would propose then making some license free bands more available in different parts of the geographic country, where spectrum is more --

MR. TRIMBLE: No, actually it can either be done by location or by frequency. Trying to correct the problem with overlays -- has an awful lot of unintended consequences.

MR. WEINREICH: Mr. Haraseth, please.

MR. HARASETH: Ye, Ron Haraseth, APCO International, Regarding public safety, in land mobile radio in general, just a couple of case studies on migrating to new technologies and efficiencies. First of all, we went through reforming, and found it to be very, very inefficient, because the FCC mandated financial incentives through type acceptance of the manufacturers.

That had very little to do with the people in that band, and in fact, most conventional land mobile radio, and particularly public safety, that is not their primary function, is to provide service through that medium of RF out there.

It is for commercial services, for commercial mobile radios, and that tower out there is their dollar sign out there. That spectrum is their dollar sign out there. However, public safety is just diametrically opposed.

Their business out there is not the spectrum or the resale of the spectrum. It is putting out fires, saving lives, transporting victims. The radio system becomes a secondary service to what they are doing.

Now, I will digress just a little bit to say that public safety would probably be very, very happy if for some reason or other commercial enterprises could provide every service that they need at the level that they need it.

But they have not been able to do that, and that is why public safety still remains as a primary service out there and probably will for some time. Maybe it won't in the future.

The thing is, is that I know in one

particular case where a gentleman was complaining about that he would never go to narrow band. He didn't have any reason to, and I asked him, well, wait a minute. All your equipment that you bought in the last 5 years is capable of narrow band.

Well, yeah, it is. Well, why. Well, it still costs too much money, and I have to change all my bay stations. Wait a minute. I know that you installed that equipment 15 years ago, and you have installed new equipment in the last 5 years haven't you? Well, yeah.

Is that narrow band cable? Well, yes. Well, yeah, he still wouldn't admit that he wanted to go to narrow band. That's a case of change, and change is hard where you don't have any incentives.

In that particular case, the FCC could have given enough time to mandate a change that would have allowed public safety, and analog land mobile radio, to migrate from their old technology to the new technology under a planned method, and it would have worked, and they still need to go back and readdress that.

The other situation, particularly public safety, is in the 700 megahertz, where the

FCC did mandate digital transition. Absolutely no analog in that 700 band in 63, 64, 68, and 69. The difficult part was determining what technology would be used as a standard, because standards are very important for public safety for interoperability.

They did determine a digital standard, and it will probably work very well in the dispatch format. We don't know yet because now it ties into the other situations with access to, and the removal of, t.v. from those bands.

So it is a complicated picture, but I just wanted to point out a couple of cases there.

MR. WEINREICH: Thank you. In the back on my right.

MR. WARNER: David Warner, from the Commonwealth of Virginia. I just wanted to echo support for the comments from Mr. Haraseth. I wanted to also point out that mandated spectrum efficiency for States and local government does have merit, but unlike our market-based friends who have business plans, and they can make those changes, public safety has to go through a due process.

And so it is just not as easy to make

those changes, and it would probably be a good idea for some incentives, say, from Congress, because that is what it is going to take, because you have got a lot of rural communities out there that really don't have the tax base, or the resources, to make these changes. Thank you.

MR. WEINREICH: Thank you. Well, we have -- yes, Mr. Blust.

MR. BLUST: I would like to make a comment upon technology, and the evolution of technology. There were several comments about we can always adopt technology to solve the problem, and use the advantages of technologies to solve the problem.

And to some extent you can, but I think that the underlying factor that has to be kept in mind is that we are not in greenfield environments. We are generally evolving systems that already exist, the huge embedded base.

And when you adopt new technologies, it takes time for those technologies to propagate. The economics to completely displace is probably prohibitive in a lot of cases.

Just the system aspects of trying to do flash conversions if you wanted to look at a total

displacement if equipment was free is probably prohibitive from disruption of users, no matter what the service tends to be.

I think you always have to keep in mind what the critical mass is, and the relationship between the generations of equipment that are out there in order to assess what the effectiveness is, and the net outcome is of being able to deploy new technologies.

So often we tend to think that new technologies solve the problems instantaneously, and in reality as we all know they do not, but it is worth reminding ourselves of that also, I think.

MR. WEINREICH: Thank you, Steve. Well, we have reached, I think, where we need to take a little break. So we will take a 15 minute break here, and give everybody a chance to stand up and move around, and talk to their neighbors, and come up with some more questions. And we would like to reconvene at five of. Thank you.

(Whereupon, at 10:41 a.m., the Workshop was recessed and resumed at 10:58 a.m.)

MR. WEINREICH: Ladies and gentlemen, we will reconvene, and we still need our colleague